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Pilfrey Solar Farm
North Lincolnshire

Proposed Solar Development

Review of Archaeological Potential and Proposed Evaluation

March 2026

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Cover: General view of PDA

1. Introduction

1.1 SCOPE OF THE REPORT

This report, commissioned by Sirius Planning Limited, presents a review of archaeological information and potential for a proposed solar development at Pilfrey, North Lincolnshire. The purpose of the report is to identify areas of significance within the proposed development area (PDA), consider whether further pre-determination evaluation is required, and suggest potential mitigation that could be secured by a planning condition.

The proposed solar farm covers an area of approximately 85.1 hectares of agricultural land located c.1.7km east of the village of Ealand and c.5.6km west of Scunthorpe, **Figure 1**.

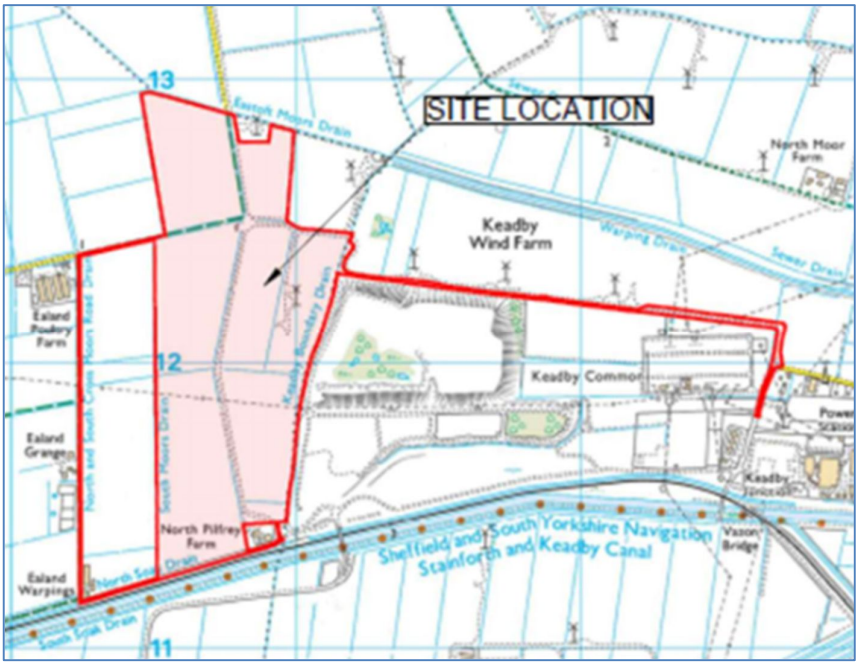

Figure 2 Pilfrey Solar Farm PDA

1.2 SCOPE OF WORK UNDERTAKEN TO DATE and CONSULTATIONS

1.2.1 Assessment and Survey

A desk-based assessment (Archaeology England, 2024) and geophysical survey (360 Archaeology, 2023) have been carried out, together with geoarchaeological deposit modelling (Geo-Arch 2024).

1.2.2 Consultations

The County Archaeological Service has commented in 2025:

[We] previously had extensive discussions on trenching during a previous version of this application from mid-2024 to the point where a trench plan had been agreed between Archaeological England (Wales) and the HER but did not progress.

As identified within HER records and considered within the submitted DBA, the application site has a number of warping drains mapped within its extents. Warping drains are of archaeological interest in their own right, particularly any remains of sluice gates, moveable dams or pumping engines.

Additionally, the process of warping can obfuscate earlier remains - essentially masking features from aerial photography and geophysical survey due to the volume of silt that is introduced atop previous land surfaces. The picture presented by the geophysical survey report may not reflect the reality of subsurface remains pre-dating post-medieval warping.

The suggestion of a watching brief is premature as we don't have enough information on the archaeological and palaeoenvironmental condition of the site in order to make a decision and I would reiterate previous advice for pre-determination trenching and test-pitting.

1.3 LIMITATIONS AND ASSUMPTIONS

The surveys and baseline information were based on a snapshot in time and the information, including that obtained through secondary sources, is assumed correct at that time.

1.4 AUTHORSHIP

This report has been written by Andrew Josephs (BA Hons Archaeology and Environmental Studies), Managing Director of Andrew Josephs Associates, a consultancy specialising in cultural heritage founded in 2002. Andrew has extensive experience of all periods and facets of cultural heritage. He is involved primarily in planning applications, EIA and the design of mitigation strategies on developments with heritage constraints. Currently Andrew is heritage consultant to over 150 companies across Europe and is currently involved in a dozen large solar schemes in the East Midlands.

He has undertaken in excess of 1200 cultural heritage assessments since becoming one of the UK's first archaeological consultants in 1992. He was previously Principal Consultant (Director of Heritage) at Entec (now Wood) and Wardell Armstrong. Prior to 1992, he worked as a field-based archaeologist and researcher for universities and units in the UK, Europe and the USA.

He has lectured widely and was a visiting lecturer in Environmental Impact Assessment at the University of Nottingham.

1.5 RELEVANT LEGISLATION, POLICY AND GUIDANCE

1.5.1 Historic Environment Statutory Legislation

The importance of cultural heritage is clearly recognised at both national and local levels.

Table 1 summarises the statutory legislation relating to the historic environment relevant to this study.

Table 1 Historic Environment Statutory Legislation

Legislation	Key Issues
Ancient Monuments and Archaeological Areas Act (1979)	It is a criminal offence to carry out any works on or near to a Scheduled Ancient Monument without a Scheduled Monument Consent.
Planning (Listed Buildings and Conservation Areas) Act (1990)	No works can be carried out in relation to a listed building without listed building consent. Designation of an area as a 'conservation area' introduces general controls over demolition and development within that area. There is a presumption in favour of the protection of the setting of listed buildings and conservation areas, except where public benefit outweighs harm.

There are no statutorily protected assets within either PDA assets. The desk-based Heritage Assessments reported that there would be no effects upon the setting of heritage assets.

1.5.2 National Policy and Guidance

In accordance with best practice the significance of an effect should be identified as part of an assessment. This is achieved using a combination of the following published guidance and professional judgement.

- National Planning Policy Framework, 2024. Department for Communities and Local Government.
- Planning Practice Guidance: *Conserving and Enhancing the Historic Environment* http://planningguidance.planningportal.gov.uk
- Historic England[1] 2008. *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment.*
- Historic England 2019. *Statements of Heritage Significance (*HE Advice Note 12*)*

1.5.3 National Planning Policy Framework

National planning policy on how cultural heritage should be assessed is given in the National Planning Policy Framework (NPPF, 2024). This covers all aspects of heritage and the historic environment, including listed buildings, conservation areas, registered parks and gardens, battlefields and archaeology.

Significance (for heritage policy) is described at Annex 2 of the NPPF as:

The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.

[1] Historic England includes its former name English Heritage

The most relevant policy within NPPF to these proposals is reproduced below,

207. In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

1.5.4 Historic England: Statements of Heritage Significance (HEAN 12)

HEAN 12 notes that significance is one of the guiding principles running through the historic environment section of the NPPF. The NPPF defines significance as '*the value of a heritage asset to this and future generations because of its heritage interest*'. Such interest may be '*archaeological, architectural, artistic or historic*' and it may derive '*not only from a heritage asset's physical presence, but also from its setting*'. Significance is what conservation sustains, and where appropriate enhances, in managing change to heritage assets.

HEAN 12 sets out three stages that should be followed to provide the planning authority with an understanding of significance of the heritage asset. That understanding:

- must describe significance following appropriate analysis, no matter what the level of significance or the scope of the proposal;
- should be sufficient, though no more, for an understanding of the impact of the proposal on the significance, both positive and negative; and
- sufficient for the LPA to come to a judgment about the level of impact on that significance and therefore on the merits of the proposal.

This approach is embedded into the following assessment.

1.5.5 Local Planning Policy

North Lincolnshire Local Plan

The North Lincolnshire Local Plan was adopted in May 2003. This plan has been replaced by the Local Development Framework but most of the policies included in the plan were saved.

The following saved policy is relevant:

HE9 - Archaeological Evaluation

Where development proposals affect sites of known or suspected archaeological importance, an archaeological assessment to be submitted prior to the determination of a planning application will be required. Planning permission will not be granted without adequate assessment of the nature, extent and significance of the remains present and the degree to which the proposed development is likely to affect them.

Sites of known archaeological importance will be protected. When development affecting such sites is acceptable in principle, mitigation of damage must be ensured and the preservation of the remains in situ is a preferred solution. When in situ preservation is not justified, the developer will be required to make adequate provision for excavation and recording before and during development.

2. Review

2.1 ARCHAEOLOGY[2]

Three sites are recorded on the Historic Environment Record (HER) within the PDA:

- Post-medieval Warping Drains east of Crowle Grange (HER 17470),
- An undated Curvilinear Ditch HER27202), and
- A Post-medieval Circular Decoy Pond (HER27203).

There are no finds reported within or near the PDA by the Portable Antiquities Scheme.

2.2 HISTORIC LANDSCAPE

Prior to the draining of the Isle of Axholme by Cornelius Vermuyden, circa 1626, the area between the River Trent and the River Don was marshland with settlement on higher land.

A ma of Crowle dated 1822 by Charles Budgen is the first detailed map of the PDA. It shows the network of network of drains and dykes created by Vermuyden and others draining into the River Trent at Keadby, including the New Idle River, Keadby Sewer, and the later Stainforth and Keadby Canal Although the map does not provide detail of all field boundaries, it is possible to identify the location of the PDA, bounded to the north by Keadby Sewer and Bewear Drain, to the east by Keadby Boundary Drain, and to the south by Stainforth and Keadby Canal.

The western PDA boundary crosses what is shown as a large field, bounded to the west by a track and drain, at the south of which is a small square enclosure with building, representing Ealand Warpings Farm. There also appears to be a small building marked in the location of North Pilfrey Farm.

The First Edition Ordnance Survey of 1885 shows a PDA of subdivided fields.

2.3 GEOPHYSICAL SURVEY[3]

The geophysical survey results are dominated by a large anomaly of the warping drain, east of Crowle Grange. The data anomalies appear to mirror cropmark findings, with the exception of a section northwest of Pilfrey Farm, where the drain splits both to the east and west but does not continue southwards with any certain definition.

A weak curvilinear response was identified in the far northwest corner of the PDA. The anomaly has been defined as of unknown origin as it does not show on any historical mapping, although it could be a historical continuation of a feature shown on an 1816 OS map.

A curvilinear anomaly similar to this was also detected in the south of the PDA, running north, which is represented on the 1816 map. It is possible the unknown anomaly may be an extension

[2] Rovira, I and Stratton, S 2024. *Archaeological Desk-based Assessment: Land to the east of Ealand, North Lincolnshire*. Archaeology England.

[3] Barker, N. 2023. *East Ealand. Geophysical Survey*. 360 Archaeology & Heritage Ltd.

of the southern linear response, linking it to the cartographic feature in the far northwest corner, although this cannot be proven.

Additional fragmented linear anomalies along with pockets of magnetic enhancements were detected, however there is insufficient form or context to determine whether they are of archaeological interest.

Natural variations in the sub-surface were detected by the survey. Stronger bands of this type of response are likely to represent buried channels that meander through the survey area. This is corroborated by a gouge auger sediment survey undertaken in 2012.

Numerous buried field drains were apparent throughout the survey extents, some of which relate to former open drainage ditches represented on historical OS mapping. Additional linear anomalies were identified running both north to south and east to west. It is likely that the responses are agricultural trends derived from ploughing and from less well-defined field drainage.

2.4 GEOARCHAEOLOGICAL ASSESSMENT AND DEPOSIT MODEL[4]

The Upper Alluvium/Warp, which is considered to be of post-medieval date, and the topsoil that lies above, are generally between 0.5 and 0.6m in thickness across the PDA, and locally up to 1m deep.

'Peat/Organics' within the PDA appear to be relatively thin - generally less than 0.15m thick, suggesting that it is on the margins of the main area of peat formation; the relatively high modelled surface of the underlying 'Sand/Lower Alluvium' indicating that the PDA lay on an area of relatively high ground that perhaps was not subject to flooding (and associated peat formation) until relatively late in the Holocene.

The distribution of peat and other organic strata is inconsistent across the PDA, with these strata absent across much of the area, with local pockets of organics distributed rather randomly across the PDA. This 'patchy' distribution' may indicate either that thick, laterally extensive peats never formed across the area of the PDA, or that subsequent drainage and agricultural activity in recent centuries has reduced the extent and thickness of peats in this area.

Where present within the PDA, peat and organic strata are likely to be encountered within 1m of the present ground surface. The lack of thickness (generally less than 0.15m) of the peat/organic strata, where present, reduces the likelihood of better preservation of palaeoenvironmental and archaeological evidence.

[4] Stastney, P. 2024. *Land east of Ealand, North Lincolnshire Geoarchaeological Deposit Model*. Geo-arch Ltd.

3. Assessment of Potential

3.1 CONTEXT

NPPF paragraph 207 states that *In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected* and that *the level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance….Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.*

There is no evidence of clear archaeological potential within the PDA, although a handful of anomalies identified by the geophysical survey may be archaeological in origin. The geoarchaeological information contained within the peat and organics has higher potential, but is patchy across the site and is generally less than 0.15m deep.

3.2 IMPACT UPON THE PEAT/ORGANIC LAYER

Fundamental to the question of impact is the nature of solar farm development. It is unlike mineral extraction or built development, where impacts on below ground archaeology may be substantial and not capable of mitigation, other than through pre-development excavation.

Solar development predominantly consists of screwed or hammered piles for solar tables, typically between 1.2 and 1.8m in depth. Their profiles are usually between 0.05m and 0.10m in diameter or profile. A typical example is shown below.

Figure 2 Typical piled supports for solar tables

Alternative foundation designs can be employed where it is important to avoid any damage to archaeological sites including concrete bases or ballast solutions, **Figure 3.**

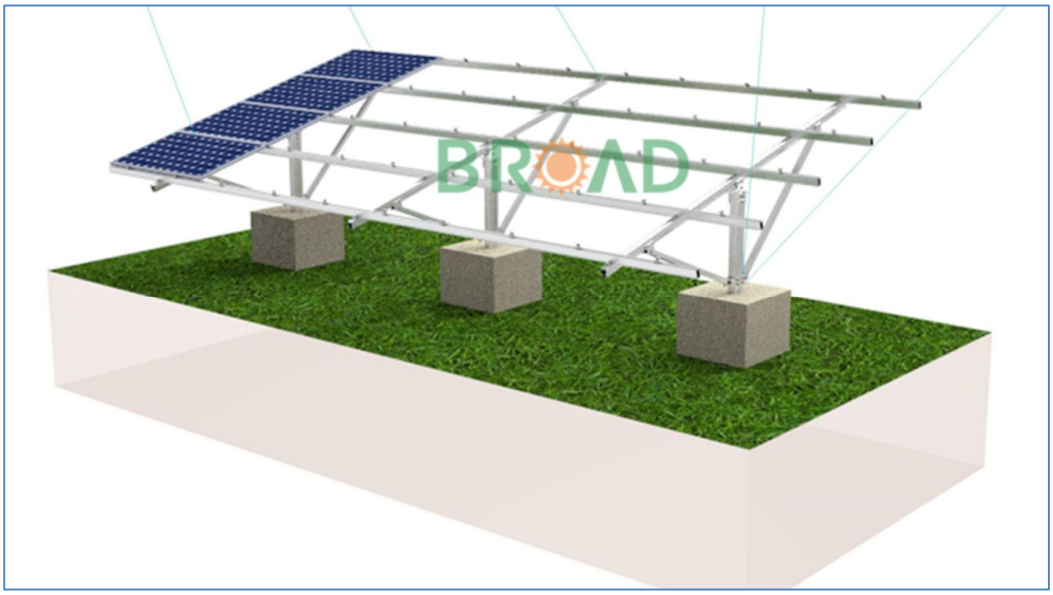

Figure 3 Examples of ground-mounted solutions employed to preserve archaeology *in situ*

In this sense, solar developments are more like a piled development that are commonly found in urban contexts. Only a small percentage of the below ground archaeology would be affected and then only if that archaeological layer was in a continuum under the whole PDA, which clearly it is not.

Historic England has addressed the impact of piling and has made recommendations for what would be acceptable in terms of potential loss.

Their 2019 guidance[5] states that the key to mitigation is understanding the zone of disturbance. The guidance does not '*prescribe the percentage of piling that might be appropriate on any given development, as on different sites, the archaeological deposits and the significance of the site will have a bearing on what is appropriate. The understanding of these issues will depend on the quality and quantity of information available from the site evaluation and understanding of previous truncation.'*

Avoidance strategies should be considered on a site-by-site basis, taking into account the scale and nature of the development and the archaeological potential. All piling operations will result in the physical destruction of archaeology directly in the path of the pile and, while it is accepted that destruction will occur, there has been much discussion of what constitutes an acceptable level.'

The 2015 edition[6] presented a formula that allowed calculation of the extent of impacts. It noted that:

'*A study into development and archaeology in the City of York (Ove Arup and Partners and York University in association with Bernard Thorpe 1991) proposed that the use of single bored (replacement) piles centred on a 6m by 6m grid would result in the destruction of between 2% and 5% of the area within the footprint of the construction while still maintaining the 'legibility' of the deposits. The value of 5% has, inadvertently, gained credence as the maximum permissible area of destruction. This does not take into account the cumulative effects of successive developments. Developments on archaeologically sensitive sites should strive to achieve lower values.'*

Whilst the 2019 guidance has superseded the 2015 guidance, it is still relevant to note that '*destruction of between 2% and 5% of the area within the footprint of the construction'* would still maintain the *'legibility'* of archaeology whilst bearing in mind the 2019 guidance that notes that '*the archaeological deposits and the significance of the site will have a bearing on what is appropriate.'*

If one applies the HE guidance to the PDA, the total area of disturbance within the PDA would be less than 4%.

This is based upon screw piles of 0.05m diameter, but this is doubled under HE guidance to allow for displacement around the pile when removed. Piles are typically inserted at 2m centres for 0.05m piles. Larger diameter piles (such as square section 0.10m driven piles) would be at 4m centres.

Therefore within a 10m x 10m area 25 piles would be required. The calculation is:

25 x π x 0.025 (the radius) = 1.96m^2

[5] Piling and Archaeology, 2019, page 34. Historic England

[6] Piling and Archaeology, 2015, page 34. Historic England

1.96m^2 x 2 (to allow for displacement[7]) = 3.92m^2

3.92m^2/100m^2) x 100 = 3.92%

Thus, although it is recognised that the 5% figure should not be regarded as the tariff below which the '*legibility*' of the archaeology is maintained, or which is '*the maximum permissible area of destruction'*, the potential area of disturbance within the PDA that would penetrate to archaeologically sensitive layers represents a maximum of 3.92% of that archaeological layer should it exist as a continuous and coherent layer under the PDA.

As has been shown, based upon the research carried out, there is a low potential for archaeology, and the main interest lies in the peat and organic layer, the extent of which is predicted on **Figure 4**.

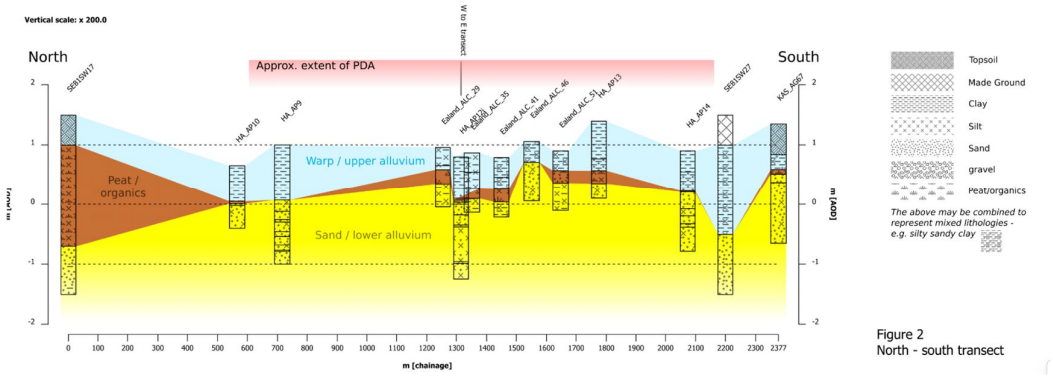

Figure 2
North - south transect

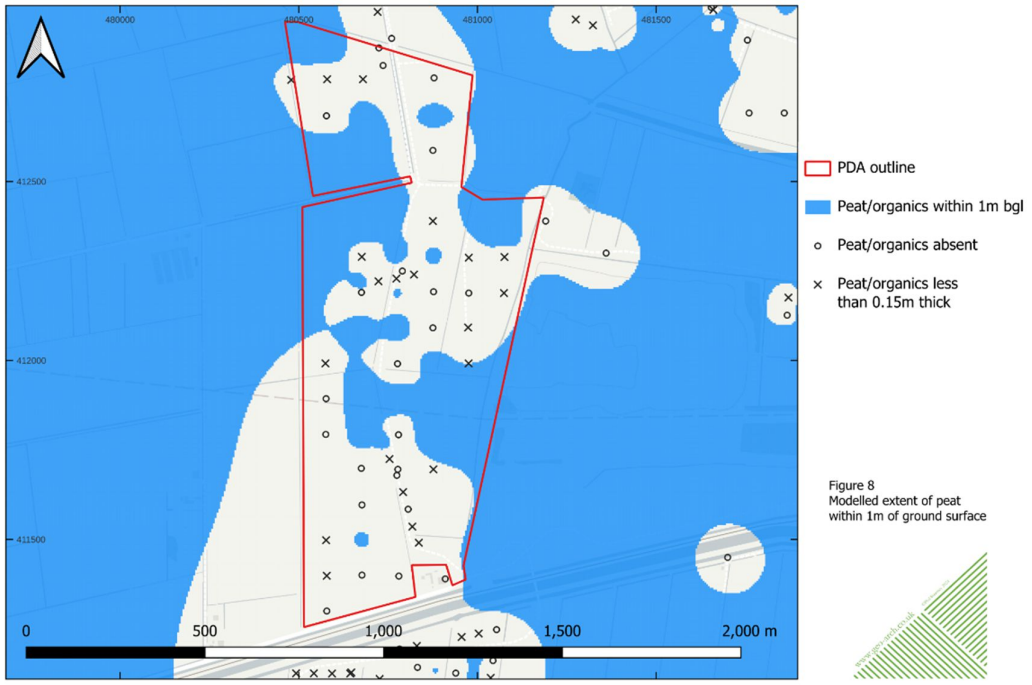

Figure 8
Modelled extent of peat within 1m of ground surface

Figure 4 Predicted extent of peat and organic layer

[7] Historic England's advice was aimed at assessing impacts in historic urban areas where archaeology, in some form, is likely to be present underlying the whole site. In rural areas this is not the case, with archaeology being focused usually on defined sites.

3.3 ARCHAEOLOGY

The geophysical survey has identified only a handful of anomalies of an undetermined nature. They were not considered to be of probable or possible archaeological interest. These are highlighted on **Figures 5 and 6** in Section 4, below. Post-medieval agricultural and drainage features are not considered to be of archaeological significance given that they are predominantly linear and often extensive, and the effects of piling would *de minimis*, the vast majority of the feature remaining undisturbed.

There is no evidence for sub-surface structures such as dams, pumping station or sluices in the geophysical survey data.

4. Proposed further evaluation and mitigation

The County Archaeological Service has signalled that trial-trench evaluation is required prior to determination of the planning application.

Based upon the above review of archaeological potential, the requirements of NPPF paragraph 207 and the low level of below-ground impact upon archaeology (should it be present), it is considered here that this should be targeted at geophysical anomalies that are of indeterminate potential as well as extending into blank areas to act as a control.

Planning conditions may be placed on a consent to require further trenching if this is considered necessary, based upon the results of Phase 1 trenching.

A proposed trench layout is shown on **Figures 5 and 6** with rationale in **Table 1**. A double width trench (no.14) is proposed to assess the geoarchaeological potential of the PDA so as to inform a detailed mitigation strategy on what may be considered the main element of this scheme that could deliver significant archaeological benefit.

Should archaeological features of significance be identified in the trenching, the scheme can be designed to preserve those features in situ through the employment of ground-mounted solutions, such as shown in **Figure 3**, above, and secured by a planning condition**.** Alternatively, archaeological excavation of targeted areas could be undertaken in advance of development.

Table 1 Trenching targets

Trench	Rationale
1	Magnetic spread
2	Anomaly
3	Anomaly
4	Anomaly
5	Anomaly
6	Blank area-control
7	Anomaly
8	Anomaly
9	Blank area-control
10	Blank area-control
11	Blank area-control
12	Anomaly
13	Anomaly
14	Double-width trench. Probable palaeochannel and near surface organic/peat

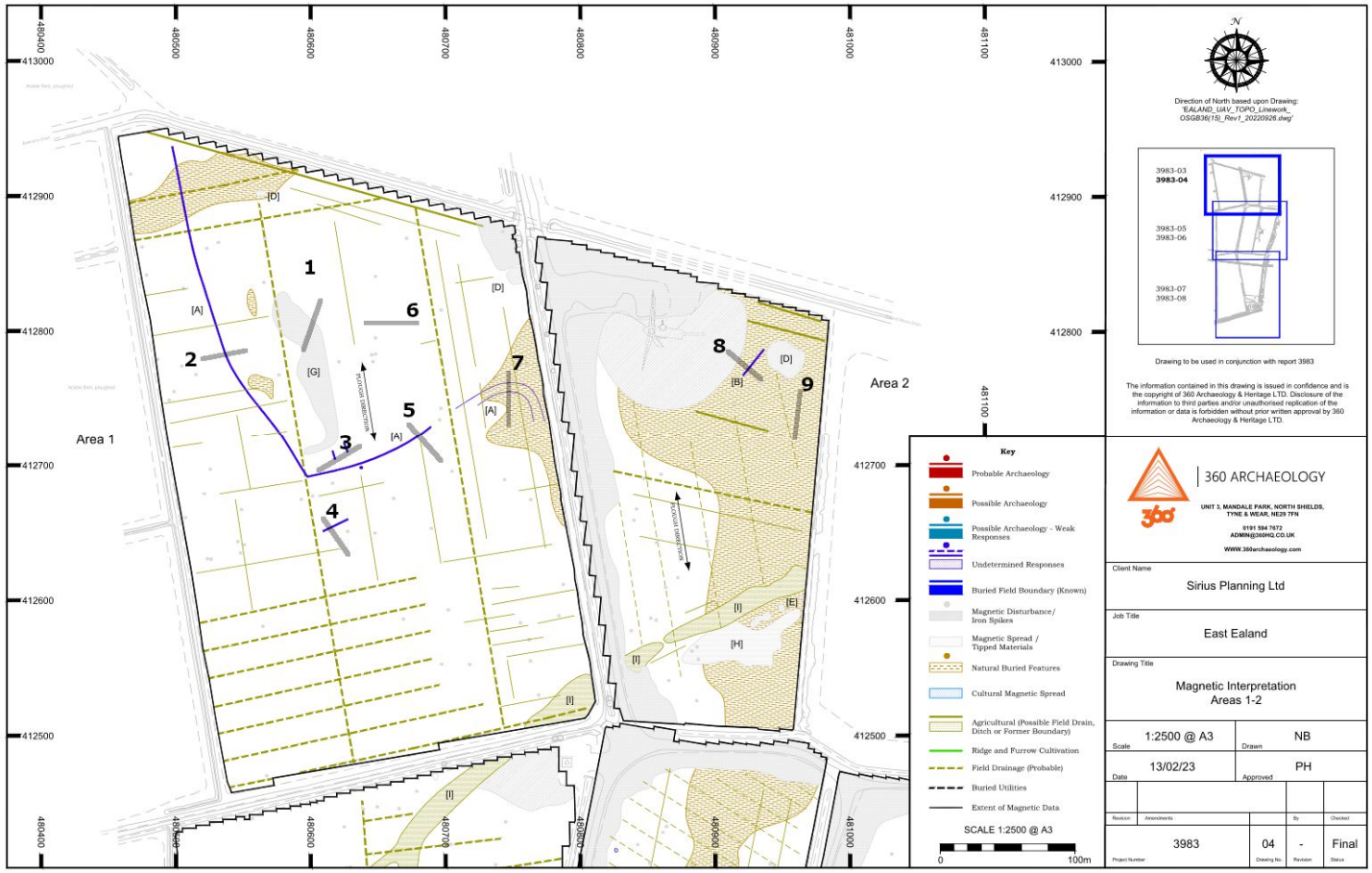

Figure 5 Proposed trench layout on geophysical survey, northern part of PDA, Areas 1 and 2

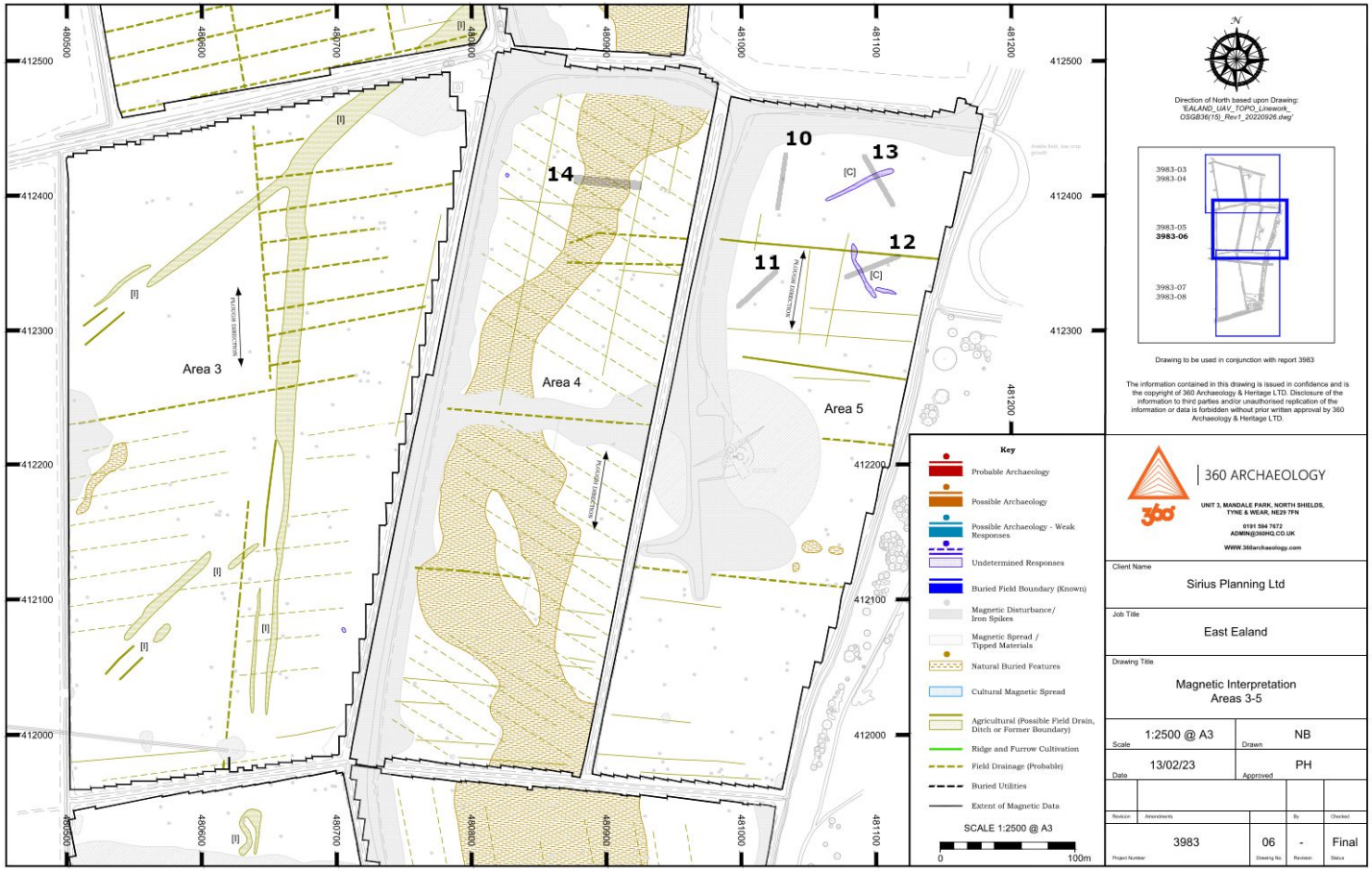

Figure 6 Proposed trench layout on geophysical survey, central part of PDA, Areas 3 to 5

5. Conclusion

The proposed trenching evaluation will assess indeterminate anomalies identified by the geophysical survey and blank areas as a control. The geoarchaeological potential of a peat and organic layer will be assessed.

The information obtained from the trenching will inform a mitigation strategy that could include further trenching, ground-mounted solutions or targeted archaeological excavation. The more significant benefit of mitigation is likely to derive from assessment of the geoarchaeology of the site.

Mitigation can be secured via a planning condition.

The approach set out in this report satisfies Policy HE9 of the North Lincolnshire Local Plan and NPPF paragraph 207.

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